SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1058---Vol. XXV.] LONDON, SATURDAY, DECEMBER 1, 1855. [GRATIS.

Original Correspondence.

THE BLAENAVON IRON AND COAL COMPANY.—No. II.

BY DAVID MUSHET, ESQ.

Sir,—But, to return to the exemplification, afforded by the Blaenavon accounts, of the efficiency of joint-stock auditors. The accounts, recollect, had been regularly audited and passed year after year, with the usual forms, by confiding assemblies outside the fortification. Patience at last grew impatient, and an investigating committee was extorted. Their labours were cut short by manœuvre before they had hardly begun; they only could examine two or three years' work in London, and were not permitted to examine any of the documents at the works; but strange things appeared with only this light stirring of the soil. I before alluded to the 800*l.* charged (by mistake, of course) to pig-iron, and paid to attendances, the search after which led to the discovery of the protruding toes of many other buried prodigies, hereafter to be thoroughly exhumed. The affair of the 4000*l.* of Abergavenny Railway shares standing in the railway books as the private purchase of two of the directors, until the shares fell in value, when the beasts of burthen, the Blaenavon proprietary, were charged with the loss, amounting to 2000*l.*, was likewise a choice morsel. The 10,000*l.* or 12,000*l.* left owing for years by some of the family symposium who were always telling their constituents how their interests were perishing for lack of ready money, is another bright plume in the auditorial foolscap. The tens of thousands year after year expended in improvements, which improved nothing but the debt, have yet to be looked into; auditors, who could not see what was under their features, can know nothing of enterprises a whole century of miles distant. But the very cream of the honour of these scrupulous gentlemen, who have such great difficulty in discovering persons sufficiently upright and pure to deserve a transfer of the shares of their spotless concern, is to be found in the warrant business. To propose for re-election to the subscribers a director who they knew had inflicted a loss of several thousands upon them, was, perhaps, only one of those salutary concealments so essential to the due management of joint-stocks. To deliver warrants for 5000*l.* of iron to a swindler, the very day they knew he had been three hours at the Mansion-house upon the charge which eventually led to his transportation, is, I suppose, only an error of judgment. But, after inducing the shareholders, in ignorance, to elect an insolvent as a director, which insolvent was the occasion of the loss, and answerable for the warrants, his co-directors, of course, took a lien on his shares in the property to secure the deceived subscribers against loss. By no means: the exquisitely scrupulous chairman, who is "so particular" who he registers, took private possession of the shares of his brother-director to secure a *private debt of his own*. I suppose all that can be said is, that the chairman is No. 1 in a company, and that No. 1 is the first law of Nature. If but a slight and partial examination of two or three years brings such matters to light, how much more is there that has escaped such very deaf auditors' ears? From the little I have seen, it is pretty sure that 100,000*l.* would not more than cover the debts due from the board to the company, setting useless and wasteful expenditure out of the question.

The monstrous cause of mischief in these concerns is the trumpery value of shares which persons elected to be directors are suffered to hold. Amounts so trifling, that it is against reason to suppose they would be troubled with the post, had they not some illegitimate source of profit in view. What else can be expected of a director holding some 20 or 30 shares out of 8000? No man should be tolerated as a director of the Blaenavon who did not hold at the very least one-fortieth of the property, or 200 shares; three or four of such directors would own a tenth, and there would then be some chance of the minor interests being protected. Suppose a director to have 40 shares, and a salary of 200*l.* a year for his attendances; for his corrupt objects he jobs the dividends down to 1 per cent.; he takes his 20*l.* on his 40 shares, and in his salary he takes the dividend of 400 shares, equal to 20,000*l.* If he held 400 shares it would then be worth his while to keep the dividends up to the promised 10 per cent.; he would clear 2000*l.* a year on them *honestly*, in addition to his salary. In that case there would be some *temptation* to be honest. It would be worth his while to manage the property well, and earn the reputation of doing so, instead of beating out his 2000*l.* a year by ambiguous and disreputable courses, creating a loss of ten times what he gains to the subscribers, whose interests he must have the audacity and the effrontery to pretend he is representing and caring for. To permit of a low qualification in the direction is merely offering a premium for sharpers to enter it. As promoters frame their own deeds of settlement for their own purposes, the Legislature ought to protect the public by declaring an adequate minimum qualification. The present Act fixes, I think, the absurd minimum of 10 or 20 shares.

In the mean time, the shareholders of the Blaenavon might do much towards defeating the conspiracy of the London board against their interests by a system of organised delegation, binding into strength their detached and scattered investments. That all the shares which the board has purchased under the rejection system are the property of the company there can be no doubt. Not only does the Joint-Stock Act, which is retrospective, make any trafficking in shares by directors illegal, except as the agents of the company for the interests of the company, but their own deed expressly points to their purchasing disapproved transfers for the common interest. They have the option of doing this, or throwing the purchase back upon the vendor until he finds an approved purchaser. This is all they can do: To suppose they are permitted to reject purchasers on a system, in order that the shares may fall individually to the directors, to enable them to vote in defence of their own malversations, is merely absurd. But not only would efficient action close this scene of criminal absurdity, a large sum of the wasted and misappropriated funds would have to be disgorged. Let the holders of shares in any town or district club together, and select one of the most competent amongst them to represent and enforce their interests at once, and to attend at the monthly meetings on the spot, after the management is reformed. Means could then be taken to retain the power in the hands of the subscribers, from whom it emanates, instead of passing it to directors for long terms, enabling them to stick so fast in the directorial saddle that they ride their constituents to death. It was this irresponsible assumption of power which ruined the Monmouth Joint-Stock Bank; connected with which unhappy affair is a very singular instance of the efficiency of the London Blaenavon management.

In 1848, this thriftless band, having passed through the period of unexampled prosperity, in which so many men of sense, unentangled with feeble characters, realised fine fortunes, and finding themselves plunged in depression, with no provision made for the rainy day, had to cast about for the borrowing, or get-in-debt, system. At last, they stumbled on the proposal to find themselves comfortably in cash by a "benevolence" of 2*l.* 10s. per share. To induce the shareholders to come out, the usual advertising placard was required—*names*. Three gentlemen in the locality, with the title of inspectors, were appointed to *give confidence*. This very act was in itself a tribute to the superior efficiency and repute of local management. Two of these inspectors were, I believe, practical men; no doubt they did service, and probably might have done much, if vested with any real control or authority, but they were merely ensigns waved in the hands of the London board, *pro re natua*. Had they held the reins they might have driven to good, but all they could do was to twitch the ribands a little now and then to the right or left, and then look back to the London Jehus, to see what they were pulling after them, much more than where they were driving to. The virtual efficacy of the inspectorship was exhibited within three years, in the fact that the third colleague, the only one of whom I had any personal knowledge, could not preserve his own property, where he had authority as well as inspection, from the ruinous consequences of dabbling in ironworks. I believe he carried with him in his misfortunes, as much as possible, the respect even of those he had involved in them; but it strongly exemplifies the real character of the London management, to seek practical improvement by the addition of such a range of competency. The more practical associates may have warded off calamity. I know nothing of the particulars, except that I recollect your old correspondent, Mr. Deakin, who from his writings appeared a very competent mine agent, published some letters exposing gross mismanagement, and was removed from a post where more pliancy was probably required. The board seems greatly to dread some infernal machine being stumbled on by erratic and insubservient footsteps. To hinder the committee of investigation from reaching the spot seemed a vital point. This much I know, that when, in 1848, a management, which must be the most silly, vicious, or corrupt, upon record, had possessed this fine property for twelve years in vain, successful ironworks in Wales started into operation, in a locality where the minerals had to be won by deep sinking, and the coals were not worth the sweepings of the Blaenavon tips and floors.

Instead of that infatuated hankering "to raise more capital," which has always indoctrinated the London board, and kept their eyes speculating round the horizon, instead of looking straightforward to their business, I should like to see a proper efficient management established, and in action, before any more borrowing is even thought of. I have no doubt that competent persons in the vicinity will testify that 10,000*l.* a year might be immediately added to the yearly profits by retrenchment in London and proper conduct on the spot. More than this seems to be even sacrificed to that pet idol, the bar work, and for which sacrifice "Exposer of Abuses" has assigned so intelligible a reason. Taking up the first report the hand falls on, I see that, in 1851, six-tenths of the produce of the furnaces was worked into bars to obtain a profit of 1300*l.*, whereas, if sold in pigs, at the rate of the other four-tenths, more than 10,000*l.* profit would have been realised. It is, therefore, not impossible that near 20,000*l.* a year could be added to the revenue by discretion and economy. Were this actually done, and such a surplus coming in to meet liabilities, there would be some rational foundation arrived at for borrowing to discharge them at once, or to extend operations. The vicious and ridiculous board notion, that the mere getting in debt will improve the position of the company, ought to be thrown overboard for ever. It should never be forgotten, that so long as they can get money to handle they care not where, how, or at what cost, it comes. Look at the paltry trick played off when the Luxembourg man, in 1853, wanted a few hundreds for his attendances: 110,000*l.* of urgent liabilities were pressing upon the concern; under the admirable system of audit, this was quite unknown to the meeting. In order to charm the flock, a dividend of 8000*l.* was declared, and under these *false pretences* the board obtained from their victims, under the good-humour of renewed dividends, a vote of 800*l.* for attendances, which they *overdrew* 800*l.* more. We all know, from the police reports, that persons obtaining illegal possession of property are in the habit of selling it for any fraction of its value, so long as they can realise something for their individual necessities.

An efficient management being once in *existence*, not in *promise*, that might, I should think, be the proper time for considering the new lease, and negociating for it in a firm and respectable manner, through men of character, and not by sleight-of-hand agents. If the nature of the existing contract will permit, common prudence suggests that a company which is 200,000*l.* in debt beyond their paid up capital, will put off as long as possible the addition of 4500*l.** a year to their liabilities. There may be some very sufficient joint-stock reason for not working the collieries, which are to become so indefinitely great hereafter. Perhaps the careful directors, who have always shown so conscientious a regard to their duties, are in hopes of negociating the royalty of one-tenth away altogether. Doubtless they have a good purpose for what they are doing, but the subscribers might have a contract for 200,000 tons of coal to-morrow, if the means were prepared to execute it.

But if the immediate increase of the rental be an inevitable misfortune, the more the reason for at once purifying, strengthening, and consolidating the management to meet it. If a company cannot hold up its head with 4500*l.* a year rental, what will it do with 10,000*l.*? The market value of their goods, upon which half a million has been expended, is somewhere about a tenth; does not the board calculate on getting the rest of the shares tolerably cheap when their last catastrophe is inflicted, of 9000*l.* or 10,000*l.* a year for 60 years?

There is something truly distressing and painfully absurd in the idea, that it is absolutely impossible for a number of Englishmen to avail themselves of such a convenience as a joint-stock company affords for the investment of some spare capital, without the certainty of being fleeced by their agents. But the root of the evil is in their own apathy, or misplaced confidence. The chances are a thousand to one against their receiving any interest at all if they implicitly trust others to manage, and expect a high rate of interest to come in certainly, like their dividends from the public funds, without taking any individual trouble in the matter. With anything like due vigilance, I can see no insuperable difficulty in obtaining a decent management of a property like this, which lies close to every man's door. They are not liable to 12,000 miles of ocean sailing, hoaxed by some ridiculous fiction, forged by the board at home, and exported for re-importation a couple of years afterwards. The Blaenavon is not a gold scheme—it is not even a French mine. It would not do for a choice deputation to proceed from the London board and report that, while they were lunching, 10,000 tons of pig-iron, ready made, were discovered and dug up just under the grass. It would not be believed; no one would give a premium on the shares upon such information, nor give the manager or the deputation any credit for their good fortune. No subscriber, with ordinary health and faculties, need for a day remain the victim of any jobbing report; and he may be equally independent of directorial concealments, if at the outset a proper control be established over their accounts and their movements, and vigilantly and actively followed up. Eschew all supernumerary directors, have as many persons as the work requires, and pay them properly, but no idlers, to expend their time and the company's assets in manœuvring and intriguing. Concentrate as much as possible, and if a manager can be found competent enough to act without consultation and advice, so much the better; elect him, and maintain him in undivided power. We have good proof that an elective despotism is the strongest form of government; and a scheming, talking oligarchy, the scramble of a London joint-stock board, the weakest and the worst, even when they are not flagellants which form the executive and the executioners of this great property.

Mountains of coal and iron are not the drugs they were a hundred years ago: it is true, twenty years' produce has been shamefully and wastefully exhausted, but there is, perhaps, enough yet left in 12,000 acres to be worth taking care of, in the face of the increasing demand for such produce. I do not know whether too much was paid for the lease in the first instance. As a general rule, joint-stocks pay twice as much for any property as a private man would give, though they ought to pay only half as much, considering their contingencies of management. No doubt Mr. Ashwell did not drive a very hard bargain, as he was to be the recipient number one, and not a payer, in the contract, and the other payees were equally hot to begin to handle. Assuredly nine years' purchase of 30,000*l.*, with the minerals, works, and stock, need not to have been complained of, had it fallen into but decent honest keeping. Abundant capital has been raised to keep at work the full number of nine blast furnaces; and those who could not make out of them an average profit of 50,000*l.*, deserve their flogging for folly as much as for "laxity." But, at any rate, it is surely now time for those who bought the lease to take something out of it, and not remain any longer the laughing stocks and the instruments of directorial wit. Union is the only strength of the shareholders, divide and rule is the directors' motto. Relying on a long course of impunity, they proceed to any length, confident that their patient flock will never join to enforce against them the ample provisions of the Joint-Stock Act, nor the ordinary criminal code.—*Nov.* 1. David Mushet

P.S.—I wish any of your readers who may have the balance-sheets and reports for the first three years of the concern would leave them with you for my inspection; I want to see exactly into what place they put the money during those years. The accumulated involution at the later dates becomes unintelligible without the antecedents.

* Since the publication of the first part of this letter, I have been authentically informed that the 4500*l.* a year represents the existing rental, *after* Messrs. Bailey's sub-rental is deducted, and that the anticipated new rent will be 9000*l.* per annum, thus diminishing by 3500*l.* the estimated yearly sacrifice for 13 or 14 years, but either 800,000*l.*, or 4500*l.* a year, is so much too much to make ducks and drakes of.

ON THE MANUFACTURE OF IRON.

Sir,—Every author who has the courage to propound theories essentially different from those commonly received as correct, must anticipate meeting with a determined opposition. If the conclusions fairly deducible from his data are antagonistic to the prevailing opinion, it is perfectly immaterial the years of research, or the extent of the sphere of his observations. A large class of persons will set him down as wrong, through honest ignorance of the subject; but a smaller class, comprising persons who cannot offer the same excuse, oppose him through prejudice, and a desire to prevent it appearing that a correct theory could possibly emanate from any but themselves. There is no difficulty in distinguishing between the two classes—those that cannot, and those that will not, see the force of the arguments adduced. The former class bluntly state their objections; the latter, as if conscious that the theories advanced are not to be overthrown, endeavour to throw discredit on the author.

The letter of Prof. Noad, in your last Journal, strikingly exhibits the means to which even an author of various scientific works will descend, when the object he has in view is not attainable in a more legitimate way. Whether his letter is like to add to his reputation or not, the majority of your readers can judge for themselves. It is, however, necessary that I should show them a few of Dr. Noad's departures from the truth in his statements regarding me, before they can fully understand the character of his communication.

He states that I have taken the Dowlais Works as my model, and "seems to imagine that the managers of other works, who venture to differ from the routine observed there, are utterly unacquainted with the scientific principles which should guide them in their smelting and refining operations." To all this I must give an unqualified denial. I have nowhere held up the Dowlais Works, or the system of management, as being superior to other works; and I challenge him to produce a single quotation from my work as bearing him out. If he has a character for veracity to lose, he will do well to exculpate himself from the charge of uttering an untruth.

I can imagine the grounds on which Dr. Noad founds his extraordinary assertion respecting my taking of Dowlais as a model. I was employed at the works there for many years, and Dr. Noad, in the plenitude of his wisdom, has discovered that, having been employed there, I naturally retain an affection for the place. If he had been at the pains of enquiring, he would not have attributed the allusions to Dowlais to affection for the place. If, in my work, I have mentioned the name of this works more frequently than that of others, the reason must be apparent to every impartial reader: it was there that my observations on the manufacture were principally made, and, when relating the results of experiments, it was incumbent on me to state this circumstance.

To substantiate the charge of partiality in favour of Dowlais requires something more than a reference to the fact of my having taken numerous examples from this works, or to my having been employed there. From what other works could I have obtained the information? Was I to expend 14 or 15 years in every iron-works in Great Britain, to qualify myself for the task of giving my experience to the public? If so, when does Dr. Noad calculate I should have been properly qualified for the task?

Although my bare allusion to Dowlais as the scene of certain experiments results in Dr. Noad's remarkable discovery that I am prejudiced in favour of that works, what will the reader say as to the purity of the sources from whence the Doctor himself draws his inspirations? Last year, he delivered a lecture at the Royal Institution, on the "Manufacture of Iron," and frequently alluded to the Cwm Celyn Works, to which he had the honour to be consulting chemist. Particular mention was made of the manufacture as there conducted; and, speaking of the utilisation of the furnace gases, he said that the principle had been carried out in great perfection at the Cwm Celyn Works. After this specimen of the manner in which Dr. Noad can praise up the arrangements at Cwm Celyn, I ask the reader whether the Doctor's partiality to this works is not manifested in all his writings?

The assertion of Dr. Noad that I have condemned the metals made at a neighbouring works, is utterly void of foundation. I have nowhere stated that iron made at the Cwm Celyn Works is inferior to that made at Dowlais, or other works; for, in truth, I do not believe there is any appreciable difference. I believe Dr. Noad to be the only person who has

put on the sentence in question the construction that it reflects on the quality of the iron made by a particular firm. I have no reason to believe that the quality of Welsh bars is other than very much the same. The statement in my work, however, is substantially correct: when a furnace is forced to the production of enormous quantities of iron, the quality of the metal cannot be maintained unimpaired.

After a laborious search, Dr. Noad has discovered that I am in error respecting the quantity of lime in carbonate of lime; but, lest he should be laughed at by your readers, he carefully abstains from stating the amount of error. Regarding the peroxide of iron in blast-furnace cinders, his statement that the iron exists as the protoxide shows that there are blast-furnace cinders with which he is not yet acquainted.

Dr. Noad's allusion to my knowledge of chemistry is as illiberal as can well be conceived. I have not laid claim to a very extensive acquaintance with this science, but I know quite enough of it for all purposes connected with the metallurgy of iron. If I possess only very general chemical knowledge, Dr. Noad asks, "how can he presume to offer any opinions respecting the theory of the blast furnace?" The cool effrontery displayed in this question must enlighten practical men as to Dr. Noad's opinions on iron-making. According to this gentleman's views, the individual who has been brought up in an iron-works, and for a period of 13 years made the working of the blast furnace his especial study, recording in journals every circumstance that occurred having the remotest bearing on their economy, is not competent to offer an opinion on the theory of the blast furnace. If such an individual is not competent, I would respectfully ask, who is there that is competent to write on blast furnaces? Most certainly there is only one person living, and that person is the "Professor of Chemistry at St. George's Hospital, and consulting chemist of two years' standing at the Cwm Celyn and Blaina Iron-Works."

As an excuse for abstaining from subjects so very tempting for criticism, Dr. Noad is pleased to inform your readers that I have as much as I can do with a correspondent in another paper. So, then, besides his ability to instruct in chemistry, he is endowed with the extraordinary talent of being able to state exactly how much an individual dwelling in a remote part of England is capable of doing. In the exercise of this extraordinary talent, he discovered that my hands were quite full, and, with praiseworthy manliness, bethought himself that now was his time to strike a blow at my work. If this letter does not undeceive him, I will state that my hands are not so full but that I could reply to his criticisms; and since my experience in iron manufacturing has been obtained in a field somewhat larger than the laboratory of St. George's Hospital, and extends over a longer period than the "two years consulting chemist's," I am nowise doubtful of the result.

One other observation, and I will conclude this *exposé*. Apparently, Dr. Noad's motive for writing is to disprove my statement respecting the inferior quality of the iron when the blast furnace was forced to the production of enormous quantities; but the manner in which he withholds his proofs points to a less praiseworthy motive. He employs your columns as the vehicle for attacking my work, and cannot prove me wrong on one single point. Now, in common fairness, the proofs should have followed instanter; but, instead of adducing the evidence against me (his analysis of numerous white irons), he coolly informs the reader that he shall abstain from publishing at present, for they are to appear, he trusts, before very long, as part of a work on the *Chemistry of the Iron Manufacture*. He contradicts me, and then informs the reader that he will publish his proofs to show that my analyses are incorrect. True, he invites the sceptical to his laboratory, but not one in a hundred of your readers can conveniently accept of this apparently liberal offer, and this he well knew at the time he wrote. Those who do not care to journey to town must wait the appearance of his work, and be at the expense of a copy, to be satisfied of—what? Why, that the analyses in my work are incorrect; and how does this modest professor proceed to the task? He obtains a piece of white iron from Dowlais, analyses it, and, finding its composition to differ from the analysis of white iron given by me, he has the effrontery to state that my analyses are wrong. The analyses given by me were made several years since (I left Dowlais years before the consulting chemist to the Cwm Celyn Company entered on his situation); the counter-analyses, by which Dr. Noad proves them to be incorrect, were made of the metal smelted within the past few months. So this professor, who is going to enlighten us on the chemistry of the iron manufacture, in addition to his other astonishing faculties, is able to determine with the greatest accuracy the composition of the iron smelted at a blast furnace years ago, merely by analysing a sample of the product obtained at the present day. The fact of the furnace working on dissimilar ores appears to make no difference—at any rate, Dr. Noad makes no allowance on this head. Verily, I have seen a few professors of chemistry in my time, but this is the greatest professor of any sort that I have had to deal with. I am curious to know the wonderful means by which he is able to accomplish all that he professes.

If Dr. Noad imagines that he adds to his reputation by depreciating my work, he is greatly mistaken. If he is preparing a work on iron manufacture, it would be more creditable to him to reserve his abuse for that occasion, than to make use of your columns for such a purpose in the manner he has done.—*Mavasion, Nov.* 26. WM. TRURAN.

NORTHAMPTONSHIRE IRON-MAKING.

SIR,—"The Oracle" gives me credit for being Mr. Mushet's champion This, however, I disclaim, Mr. Mushet being the ablest practical and scientific writer who appears in your Journal (on paper), and well able to defend himself. I appeal to you, Mr. Editor, to say whether my letter really was, as "The Oracle" would intimate, made up of "rhapsodical ravings, coarse invective, and senseless ridicule"—unless, indeed, our "Oracle" and the "scientific chemist," whose notable doings in the way of black cinder we have seen detailed, are identical. If so, and I incline to suspect something of the kind, my remarks must have appeared to involve a certain dash of personality; but I must plead my ignorance of this identity as my excuse.

It is "The Oracle," not "Young Iron," who cannot master the doctrine of oxidisation; and the latter genius will now fish out, for "Oracle's" behoof, why iron, when combined with a minimum dose of oxygen, is oxidised, though he denies the fact. Dr. Justus Liebig thus defines the meaning of oxidised:—"The act of combining with oxygen is called the oxidation of a base, and bases which have united with oxygen are said to be oxidised." Again, the same eminent authority informs us that iron is rapidly oxidised by immersion in dilute sulphuric acid, and the solution, on crystallising, forms sulphate of iron, composed thus:—Protoxide of iron, 36; sulphuric acid, 40·1; water, 9 = 85·1 parts. In other words, the iron is rapidly oxidised with the formation of protoxide of iron; and, therefore, by Liebig's definition, and which is admitted by all chemists, protoxide of iron is iron oxidised; and our "Oracle" must get up very early in the morning to confute this argument, and falsify my deduction.

As to oxidised meaning a thorough oxide, I see no authority for the definition in any chemical book of repute; nor do I think Lindley Murray would sanction such an extraordinary metamorphosis of an adjective into a noun substantive. Be that as it may, "Oracle," by denying that iron combined with a minimum dose of oxygen is oxidised, has denied the definition and deductions of all the great chemists of the age; and at the same time, apart from a chemical point of view, he violates all common sense by maintaining that what is rusted is not rusty.

With respect to mill and forge cinders, the "infant prodigy" merely pointed out the discrepancies between "The Oracle's" definition and his deductions. With regard to "good grey cinder," can "Oracle" give a better definition than my own? or can he give any other? I think black cinders, with 20 per cent. of iron, are not the kind of cinder operated upon by the ornamental cinder patentees; I give them credit for more discernment. I do not know what may be the annual production of "good grey cinder;" but, if I am to believe Mr. Truran, it cannot be very extensive, for he informs us that 700,000 tons of iron are annually lost in the cinders of the blast furnace—a fact, I confess, I do not much doubt, after "The Oracle's" admission, so naively implied, that ironmasters do not make white iron by choice. Verdant as I may be, I no more supposed that they did so than that they knew how to avoid it. Unless ironmasters so far return to the "old times" as to run good cinder, they can never run good iron—a fact which I know is felt, if not expressed, by the whole trade; and I humbly conceive that they would be more likely to enrich themselves if they saved the 700,000 tons of lost iron, than by persisting in the present insane system of waste and deterioration. As to its being the cheapest system, forced upon manufacturers by railway shareholders and directors craving a cheap article, it is mere transparent humbug. The cheapest process cannot be that which wastes 29 per cent. of iron in the cinders.

"Oracle" is facetious over the rails made at Dowlais, and indulges in some playful raillery. I cannot tell him where these rails are located, but specimens of them were exhibited by the late Mr. Mushet at the subsequent meeting of the British Association, at Liverpool; and I perfectly recollect the indignant surprise with which the Baron de Suermonde, of Seraing Iron-Works, received the announcement, from Sir John Guest himself, that, notwithstanding the marvellous superiority of these rails over those of his ordinary make, "he could not entertain Mr. Mushet's process." I saw these rails, nicked round with a cold chisel, resisting the utmost efforts of the most powerful men from the Dowlais forge to break them, with the heavy hammers used for straightening the rails; and I saw the best Dowlais make of rails broken, under the same circumstances, with from 10 to 15 blows, whilst 120 blows upon the patent rails only served to bend them. Mr. Mushet's work *On Iron and Steel* was, I think, published in 1840, not quite a quarter of a century ago, and certainly not a quarter of a century before the discovery of the Northamptonshire ore, specimens of which were, about the year 1815, forwarded to the late Mr. Mushet by Mr. Comfield, of Northampton, and subsequently optician at Cheltenham—a fact to which Mr. Comfield can testify; and I can only repeat, that if the principles so clearly laid down in Mr. Mushet's book, for fluxing ironstones and iron ores generally, had been carefully followed out, there would have been no difficulty with the Northamptonshire ore. It was not wholly from hearsay that I learned what is going forward in the way of making white iron and black cinder; for I have myself seen a blast furnace under the hands of a "scientific chemist," and subsequently under the tender mercies of a rule-of-thumb man, and can add my mite of testimony to that of the "such and such a one" of our "Oracle."

"The Oracle" must grant that, if any one sample of furnace cinder contained ·4 per cent. only of iron, what was done when that cinder was produced may be done again; and, therefore, it is not contrary to the laws of Nature that blast-furnace cinder should contain not not more that ½ per cent. of iron, when produced under suitable conditions, and which conditions it would behove ironmasters, for their own interests sake, to study. I am in no way ashamed of my name, or my cognomen; and as "Young Iron" I shall be happy to head a subscription for Mr. Cort, the son of the greatest benefactor of the nation at large that ever existed, and thus set an example to others, to wipe away the national disgrace, made patent in the fact that such a benefactor's relatives have not been already specially provided for. I can only suppose that the public were, like myself, ignorant of the existence of these descendants of Mr. Henry Cort. I invite "Oracle" to follow my lead: anonymous subscriptions are as welcome as those with the real names blazoned before them, and they are at least more likely to be sincere testimonials to the worth of inventors.

"Old Iron" should not wholly overlook a chemical consideration of the subject of iron-making, as chemical knowledge may powerfully assist the practical manufacturer of iron. Unfortunately, chemists are seldom, if ever, ironmakers, and ironmakers rarely possess any amount of chemical experience or knowledge. I do not believe that I am destined to remove some of the difficulties which every ironmaster feels; to remove these difficulties, the prejudices of ironmasters must first be overcome; and the extent of these prejudices may be inferred from the expressions of "Old Iron," who, though evidently a sensible and experienced manufacturer, alive to the imperfections and wants of the routine and business he has been engaged in for 30 years, tells me I must not lecture him upon the suitability of grey iron for railway bars. Let me ask him what he would have thought, 30 or 40 years ago, of making white iron from the blast furnace for such a purpose? Manufacturers are certainly the best judges of the operations they conduct, but are not necessarily endowed with the mental power of foreseeing that these operations can never be superseded or improved upon. The old-fashioned hammermen would have ridiculed the notion of finishing long bars of iron in less time than it took them to transfer their blooms from the "chafery" under their hammer. The ironmaster who cocled his blast in a water-vault laughed to scorn the idea of heating this blast, and the veteran mail-coachman of 40 years since would have turned an incredulous ear to the representations of any man who had predicted to him a speed of 60 miles per hour for passenger conveyances. Just so, "Old Iron" tells me I must not lecture him about grey iron; yet this does not prevent me from foreseeing that a return must be made to grey iron before rails can be made to last for 100 years, or one-quarter of that time.

That I should confer on ironmasters and railway companies a lasting obligation by showing them how to convert grey pig-iron into railway bars which would last 100 years is a truism, as far as the railway companies are concerned; but will "Old Iron" inform me what return they would make me for the favour conferred? I know the reward that the late Mr. Mushet reaped from the process by which the rails at Dowlais were manufactured; it was the same kind of reward which he had reaped by showing that iron could be combined with carbon to form steel in the crucible, a process without which half the melting holes in Sheffield would be closed. It was the reward reaped by Josiah Marshall Heath, for teaching the steel-makers of Sheffield to make good cast-steel out of almost any kind of iron, enriching the trade to the extent of millions, and stimulating the production of wealth and the prosperity of manufactures throughout the world; whilst a fund of some thousands of pounds was kept in store to fee or bribe the lawyers, as the case might be, to stave off the just claims of the original inventor. It was the reward assigned to Neilson, the next greatest inventor after Cort, but who fortunately possessed the power to wrest from the piratical crew those rights which their inconceivable audacity and meanness had denied to him. It was the reward which England and England's manufacturers have, as a rule, assigned to all those eminent inventors on the fruits of whose genius and labours they have built their colossal fortunes—viz., contempt for the inventor and his inventions, openly expressed, and in most cases the secret adoption of the principles disclosed, to be glossed over, under future detection, by the impudent assertion that they had long known the thing, and had practised it. Thus the hot-blast patent was assailed by a wiseacre, who had years previously forced smoke and flame into his furnace, it being logically argued that smoke and flame and heated air were one and the same. I do not wish to ride rough shod over sober-minded, practical men, such as "Old Iron;" I have too much respect for them; but it is in vain for him to attempt to bolster up an untenable position. Ironmasters confess to a waste of 10 to 20 per cent. of iron in the cinder under the white iron system, and they also confess that they do not know how to obviate it, and their best rails crush, laminate, and give way in spite of them. There must be some great evil in the system which produces such results, and the mainspring of this evil originates in the persistence which obtains in believing that it is necessary to make white iron in order to meet the requirements of the age. There is little to choose between the waste of the present system and that incurred under the old refinery process; but how different was the quality, and what millions would have been saved to this country if railway directors had been compelled to use, and ironmasters to make, their rails from refined mine pig-iron only.

Does it not occur to "Old Iron" that the desideratum is to produce from the blast-furnace iron which needs neither to be white, nor to be refined, in order to puddle with facility, to form the strongest bodied iron for rails, and to produce this iron with no greater loss of metal than the copper smelters sustain in their intricate and elaborate processes? I have advanced nothing but what I know, and can prove, when opportunity shall offer, or when I can afford to be patriotic enough to lay the fruits of my own labours, and those of others confided to me, before the public; meanwhile, I point to the Dowlais rails as a proof that it is not the means of producing good rails which are wanting, but the incredulity and prejudices of the trade effectually shut the door against all improving innovations, unless the inventor is prepared to give away his knowledge, and be called a quack and a visionary for his pains.

With regard to the Duston Iron Company, who that perused their prospectus could have expected anything but a "catastrophe?" I think I saw a dozen advertisements for tenders, inserted in a style which Moses and Son might covet to imitate; and the whole affair was got up at a moment's notice, and apparently without a thought being given as to any settled plan of operations. The usual fate of joint-stock iron companies has, as a matter of course, overtaken it.—*Nov.* 26. YOUNG IRON.

IRON IS IRON.

TO THE LANDOWNERS OF NORTHAMPTONSHIRE, WHO HAVE IRON ORE ON THEIR ESTATES.

GENTLEMEN,—It would seem to be quite as providential to the necessities of the moment that large beds of iron have been discovered in Northamptonshire, as it is beneficial to you as a means of wealth. The discovery has happened at the time when the ore of the great smelting county is fast failing, and can only be obtained, in consequence of its scarcity, at an enormous price. It is providential that ore is to be found in a contiguous county, and there is a supply which will require centuries to exhaust. *Iron is iron*, whether found in North or South Staffordshire, Wales, Scotland, Ireland, Northamptonshire, or Cannock Chase; and wherever found, or in whatever combination, still *iron is iron*. In the *Mining Journal* of late some practical chemists have been talking of the state of the iron in Northamptonshire as a peroxide, protoxide, carbonate, &c.; they have been splitting hairs on these points: then as to whether the ore be siliceous or argillaceous. Well, these learned gentlemen are at work to get at this iron where it exists, to separate it from any impurities with which it is deposited and so combined. They have come to the positive conclusion that iron, in its pure metallic state, exists in a large proportion to the impurities in the ore of Northamptonshire. They have only to settle the best means of treating these ores to deoxidise the metal, and separate it from its combinations. I doubt not that this will be speedily accomplished; science is at their elbow, if they will employ it, and will soon put them right. But let me say to the landowners that, in order to accomplish the production of good iron from their Northamptonshire ore, they must look a little more to their own interests. Here more than anywhere is wanted "the right men in the right places"—honest men, interested only in the success of the smelting the Northamptonshire ore, and smelted only on the soil of the respective estates. In this way alone can the true character of the ore be settled, or appreciated according to its real value. But so long as the ore is sent away, to prop up a failing supply in other places, and its character entrusted to those only who use it largely, and as unscrupulously denounce it as of little value, so long its value to the proprietors will be kept down.

Let the principle be admitted, and it cannot be denied, that *iron is iron*, wherever found, or with whatever it may be combined, and can be obtained pure wherever it exists, the Northamptonshire landowners will be amply repaid for looking to their own interests; their own royalties will then bear their rightful proportion in the use of the ore. Can it be that the ore of Northamptonshire is sold for 9d., whilst that in Staffordshire is not to be obtained at a less cost than 20s. per ton? *Iron is iron*, and as readily and as purely, I am convinced, to be obtained in Northamptonshire as in Staffordshire, though not in the same way.

I rejoice in the names of Mushet, Elliot, and Higgins, disputing on these points of chemistry, and "Young Iron" nobly supporting them. Keep your ore at home, smelt it on your own soil, till its worth is established; then you may help your needy neighbours; but do not send a ton away till it has been submitted to an honest and fair trial. Remember always that *iron is iron*, and may always be got out, wherever it exists, as pure in one combination as in another. FERRUM.

Nov. 27.

BRITISH IRON MANUFACTURE.

SIR,—Mr. Cort, in his communication in the Supplement to your last Journal, wishes to know in what my invention of "iron bottoms" to puddling furnaces differs from that of Daniel Onions. The following he may rely upon as truth:—Daniel Onions had his "bottoms" cast about 2½ ft. square, and 4 to 5 in. in thickness, and a hollow was turned in the centre, similar to a dish or bowl, in which the puddling was to be performed. These bottoms were then firmly and solidly set in fire-clay and sand, rammed tight all round. This is the description I had of Mr. Onions's "iron bottoms" from several parties who saw them put to work, among whom were Mr. Cook (formerly of the firm of Cook and Fryer, of the Clydach Iron-Works), Mr. John Jones (formerly engineer of Nant-y-Glo Works), and Mr. Cornelius Guest, of Dowlais. Now, after these "bottoms" had been a short time at work (a very few hours only) they melted away, just as so much pig-iron would under similar circumstances, and consequently became of no use or utility whatever. Now, of this circumstance I believe Mr. W. Crawshay knew nothing at the time I mentioned my "iron bottoms" to him; or, if he did, it was only that Onions's "bottoms" melted rapidly when brought to a working heat, for his remark to my offer was, that he would melt out any "iron bottom" I could put into a puddling-furnace in five minutes after it came to a working heat; to which I replied that I would engage to put in such a "bottom" that he should never be able to melt out as long as he might live. This he stated to be an impossibility, and therefore not to be believed. I then asked Mr. Crawshay why he did not melt out the sides of his "refiner's boxes," when exposed to a proper working heat, which boxes are exposed to a much higher temperature than is generated in a puddling furnace? To which he replied he did not know. This brought an explanation of the principle of my invention to Mr. Cort's furnaces—viz., to take care that the under side of the plates forming the "bottom" should always be exposed to a current of atmosperic air; by such an arrangement the plates forming the "bottom" could never be melted in the highest temperature of a puddling-furnace.

In 1818 I wrote a *Treatise on Iron Metallurgy*, under the advice and patronage of Mr. Anthony Hill, of Plymouth Iron-Works, Merthyr Tydvil, and Mr., but afterwards Sir, John J. Guest, of Dowlais, a copy of which work was taken by nearly all the then ironmasters of Monmouthshire and South Wales; and in the 30th Letter* of such work I proposed a new method of puddling, provided iron bottoms were used on the principle I recommended. Indeed, I tried all in my power to have the invention put into practice, but the general impression with ironmasters was that the affair was impracticable, and my efforts on the subject became almost offensive, so much so that, in ridicule, I was at many works termed "Mr. Iron Bottom." Now, with respect to Mr. Harford, of Ebbw Vale, being the first person who put these "bottoms" effectually to work, I have nothing to object to, only simply that he was not the inventor of them, nor did he make such a claim in his patent for a new method of puddling, by which he greatly improved the quality of his wrought-iron, and obtained a considerably higher price for his new results than his neighbours; and this improvement in quality was obtained by adopting the new method of puddling described in the Treatise above referred to, and for which improvement Mr. Harford jocularly told me he would take out a patent, to which I replied he was perfectly welcome to do so, as he had subscribed for a copy of the Treatise. In 1820 I went to London, and remained there about 12 years, considering myself not fairly treated by the ironmasters of Monmouthshire and South Wales, having devoted much time and expense to the improvement of iron metallurgy, more especially—1. In the coking of coal in ovens, commenced about 50 years ago at Pontypool.—2. In producing a most desirable and active flux for use in smelting, refining, and puddling-furnaces.—3. In a new method of puddling pig-iron.—And, 4. An improved mode of working blast-furnaces. All of which improvements were detailed in the Treatise above mentioned, an enlarged and improved edition of which work, arranged on the atomic theory of Dr. Woollaston, I am preparing for publication, the half of which is already written; but whether I may live to complete the other half is quite uncertain, as I am now fast approaching to 80 years of age.—*Nant-y-Glo, Nov.* 28. S. B. ROGERS.

P.S.—As the subject of black cinder for blast-furnaces has been lately discussed in the Journal, permit me to say that the following is the average yield of iron in 21 analyses of such cinders, taken by myself professionally—viz., 20·5 peroxide of iron per cent. in the results, equal to 14·35 of metallic iron. The annual loss of iron consequent upon the present wasteful system of driving furnaces for quantity is a problem for the curious to work out at their pleasure. A low average yield of this black cinder may be safely taken at 25 cwt., for every ton of white pig-iron made on the present destructive and useless system of iron smelting, involving an immense, irretrievable, and wanton loss of both labour and material, individually as well as nationally.

* The contents of which Letter was puddling on iron bottoms with a new flux whereby finery cinders are made fit for beneficial use in the smelting furnace; and a project to equalise the working of blast-furnaces.

GOLD IN IRELAND.

SIR,—I am happy to see the prejudice which formerly existed in the minds of my English brethren against Ireland and Irishmen fast wearing away, and a more liberal and friendly spirit taking its place; this increasing daily, as frequent intercourse convinces, it was as unjust to the first as undeserved by the latter. How gratifying to an Irishman, whose love of country is by some considered a failing, to watch, if I may use the phrase, the pleasing disappointment of his English friend's first visit to Ireland, on finding it surpassing in richness of soil and varied scenery his anticipations. Another feeling takes possession of his mind, and, as if awaking from a dream, he exclaims—What can I have been about, seeking on the Continent the wild, the beautiful, in landscape, when I had it here? Why place in foreign speculations capital which I could have invested with safety in this productive land? Why employ it (capital) at the Antipodes, beyond my own control, opportunities daily offering, when under my own eye I could watch its diffusion, giving to the hardy tiller of the soil that happiness and comfort at home which he is often compelled to seek in another hemisphere, enabling him to retain and provide for his athletic sons, ever ready to swell the ranks of that brave army whose heroic devotion is the admiration of the world, and to spill their blood in the fearful struggle now pending, to relieve Europe from tyranny and oppression? nor have these humble sons of Erin tarnished the splendour of its glorious victories. Why not, then, as cheer upon cheer is given by their English brothers in arms when assailing the deadly breach, why not, I say, have equal confidence at home, and let cheer upon cheer encourage and stimulate to exertion every right-minded English and Irishman to make common cause, seeking to improve the value of every acre of land, be it agricultural or mineral, making this the arena of a brotherly struggle, and, by so doing, administer to the comforts of those who give us the blessings of peace at home?

Oh! Ireland, how little, very little, is known of thee; yet are you within a few hours' journey of that Queen of Riches—London. A thousand pens are ever ready to describe the wealth, the beauty, the grandeur, of far distant lands; but who thinks of, or cares for, thee? How may schemes of the vile, the heartless, have proved but too successful to divert from its legitimate current English capital, to projects existing only in the wily brain of the adventurer, and the dazzling prospectus! Let your truthful and honest columns, ever ready to uphold the good and expose the wicked speak. Had but a tithe of that golden stream which flowed so freely been expended at home, its regermination would have been rewarded, nor allowed the arid sands of suspicion and distrust to withhold it now: nor is this to be wondered at, when such devastation and utter ruin have been brought to many once happy hearths.

See the phalanx of able contributors to your Journal. See the time and research devoted to foreign, English, and Welsh auriferous resources. Gold in Australia, California, America, England, and Wales; and has not Ireland her golden rocks and streams? Do not imagine that Wicklow alone affords the precious metal. Gold is still found after heavy floods by the peasantry, and brought to Dublin for sale. The amount received during the year is often very considerable. Roscommon, Leitrim, Fermanagh, Wexford, Sligo, Donegal, &c., have more than mere indications of its existence. On one occasion, a specimen from the latter county was placed in the hands of that eminent chemist, John Mitchell, Esq., whose practised eye detected its richness, and on comparing it with another from Wales, then under his treatment, pronounced it identical. Why do not some of those able and scientific men come and judge for themselves? What spell is around them? Do they doubt? then dissipate by a visit such unbelief. Do they think because an Irishman writes with an anxious heart for the general good of his country he is unworthy of belief, and that what he states is illusion? I fearlessly say, test his assertions by personal inspection.

At present, doubts naturally arise whether the quantity of gold found in these isles would prove remunerative, too much being left to theoretical speculations; for truly, I must confess, very little light has as yet been thrown upon the best and cheapest method of extraction. Surely, when in connection with the baser metals, of which hereafter it may form a profitable adjunct, Ireland offers many advantages in inexhaustible water power and cheap labour, &c.

One bright hope is before me. The Dublin Chemical Society, with a Cameron at its helm, stepping forward with true patriotic feeling to dissipate the cloud that at present hangs over Ireland's latent wealth, and place before the world her valuable mineral, giving its all-powerful aid and scientific assistance to the less learned, though not less elevated, miner and mineralogist. I hope I shall be forgiven intruding this long letter, and that it will be taken in the friendly spirit meant. PAT.

Dublin, Nov. 13, 1855.

IRON SHIPBUILDING IN AMERICA.—A steam frigate has been launched from the Philadelphia Navy Yard, 262 feet long. Her keel is 250 feet; from knight-head to taffrail, 234 ft. 4 in.; length over all, 301½ ft.; breadth of beam, 51 ft. 4 in. She is fitted with four boilers, placed at the very bottom of the ship, each 11 ft. high, 15 ft. long, and 13½ ft. wide, each having five furnaces, with 7 ft. grates. The propeller is so constructed that it can be hoisted completely out of the water when not in use. She has two engines with horizontal cylinders, 72 in. diameter, 3 ft. stroke. The propeller is of brass, 17 ft. diameter, and weighing 200 tons.

BLASTING OPERATIONS IN MINES AND QUARRIES.

The most simple, most rapid, and least laborious mode of detaching stones, coals, and metallic minerals from their parent rock has been, in the most primitive period, and in the earliest stages of civilisation, the great object of the labourer. With simply pecking at the joints of cleavage, and without in many strata even that poor advantage, the slow use of fire, and other means which Nature suggested as the only ones at command, toilsome and laborious indeed must have been the removal of a single block of stone, or the disintegration of a cwt. of mineral. In the 14th century the use of gunpowder, which had been invented two centuries before, commenced a new era in the mode of carrying on such operations; blasting at once, to a certain extent, became in itself an art, and for ages, with no other explosive agent at command, it has been employed exclusively for mining and quarrying purposes. While even up to very recent periods we have had many considerable improvements and modifications in the construction of boring tools, and the *modus operandi* of blasting operations, no change has taken place in the explosive agent itself, except in the attempt to introduce Schonbein's gun cotton, which was productive of an awful and fatal accident at the factory of Messrs. J. Hall and Son, the gunpowder manufacturers, who purchased the patent, by which its employment appears to have been entirely lost sight of, except for chemically experimental purposes.

For many years the manufacture of gunpowder has gone on with the comparatively usual regularity of other handicraft productions, but since the commencement of the present war against Russia the great and increasing demand, both in England and France, has caused a gradual increase in price, while the several materials of which it is composed have each become an object of great commercial gambling and monopoly, and little dependence can be placed by the gunpowder manufacturers on even a precarious, much less a regular, future supply. To so fearful an extent has, indeed, this increase in the price of gunpowder arrived, that it has seriously infringed on the calculations under which many existing contracts were made for the production of stone, for extensive building, dock, marine, and other hydraulic works, that daily large losses are the consequence; and to carry many of them out, without some modification of terms, would be utter ruin to the contractors. It is asserted by many, probably one-sidedly interested parties, that the present exorbitant price of gunpowder is but the usual effect of large demand, which will soon be met with increased supplies, and the market thus find its customary level. We fear, however, that this idea is perfectly Utopian, and that there are but little hopes that any reduction can take place while all that the Governments of England and France can secure are required for the war, which fact alone will keep up the price of the material, by stimulating the enterprise of continental merchants.

Having thus attempted to show how little we may depend in future on a full supply of our hitherto usual blasting agent, we turn to a new question—With what confidence may we hope for a substitute? Electricity appears one resource, not merely as the agent for firing the explosive material, but such a concentration of the electric spark as will convert it into the blasting element, in imitation of some of Nature's grandest operations during thunderstorms, in which, from the rending of rocks and the destruction of solidly constructed buildings, we have ample evidence that the right method of application is alone the great discovery to be made. In the Journal of 27th Oct. last will be found a communication from "An Englishman, Staffordshire," which we recommend to the consideration of our readers. From this it would almost appear that, from an accidental circumstance which occurred at the Gutta Percha Works, in experimenting on about 50 miles of wire, for a submarine telegraph, the science has received such additional knowledge as may lead to the very requirements for blasting purposes to which we are endeavouring to call attention. In fact, in connection with a voltaic battery, a powerful Leyden jar was formed, charged, and exploded, with results which at the moment puzzled and astonished the electricians of the establishment, but which, from the deductions drawn from the circumstances, may eventually, in all probability, lead to most important and startling discoveries. As our correspondent ("An Englishman") appears, from his style, to be well informed on the science, we trust he will not let the matter drop, but favour us with further communications, which may at least stimulate enquiry, and at length lead to the knowledge required.

In further consideration of this question, the next point which presents itself is, the possible application of any of the percussive or detonating compounds so well known by chemists, or such a modification of some of their elements, as may produce an explosive compound, at once safe, efficient, and economical, and by which gunpowder may be superseded in blasting operations. In the Journal of the 7th of July last we inserted the substance of a paper "On Gunpowder and its Substitutes," read by Dr. Gladstone, F.R.S., at the Royal Institution, in which much valuable information is contained on the nature of many explosive substances, such as the nitrates chlorides, and iodides of the metals and metaloids, the iodides, and chlorides of nitrogen, &c., some of which are of so dangerous a character as not only even to explode under water, but will scarcely bear manufacture. A white powder, consisting of chlorate of potash, yellow pussiate of potash, and sugar is also described, which we find from Thomson's *Cyclopædia of Chemistry*, was experimented on by Augendre, when he found 6 grs. at 5 ft. distance propelled a bullet through 100 pages of paper, while common gunpowder only made an indentation in one sheet. We have thus endeavoured to call attention to the various explosive means at present known, by which, should the present price of gunpowder continue, or perhaps increase, a valuable substitute may be found. Whatever may be the result, it is satisfactory to find, as stated by Dr. Gladstone, that the Government had lately organised the means of examining every suggested improvement, which would, of course, apply as well to peaceful commercial purposes as to war; and that the parties officially appointed to the task were actively engaged in the investigation.

STEAM-POWER FOR PROPULSION ON CANALS.—The application of some mechanical power, which should entirely supersede the employment of horses on canals, has long formed a subject of much interesting notice and discussion in our columns; nor have we failed to notice any plan which appeared practicable for carrying out so desirable a result. Some months since we referred to a steam-tug on a novel principle, constructed by Mr. Inshaw, of Morville-street, Birmingham, and experimented with on the Dublin Grand Canal, which proved so successful, both in speed and economy, that the company immediately ordered six such tug-boats. From the satisfactory manner in which these boats performed the haulage, the Regent's Canal Company offered two premiums of 100*l.* and 50*l.* for the best steam tug-boat produced; Mr. Inshaw entered a new one, the *Birmingham*, which gained him the first-named prize, and so satisfied were the directors of its efficiency and superiority, that it has been purchased, and now works the whole of the craft through the Maida Hill tunnel, and between Paddington and the Hampstead-road, completely superseding horse-power on that portion of the canal. We also learn that Mr. Rawcliffe, agent to the Earl of Balcarras, in Preston, has introduced a steam screw tug-boat on the canal between that town and Kendal, which has confirmed every expectation entertained of its performance. The engine has two 8-inch cylinders, is of 20-horse power, and occupies but little space in the first boat, to which four others are attached, forming a boat train. These five boats, in the first experiment, conveyed each trip 200 tons of coal, with an average speed of two miles an hour. A greater speed might be attained if the canal were deeper, but at a higher velocity a large quantity of water accumulates at the bows, causing the boat to form a channel, and often to scrape the bottom. By the old system one horse dragged a boat of from 40 to 45 tons burthen at an average rate of 1¼ mile per hour. Mr. Rawcliffe has, since the first experiment, introduced a new iron boat, capable of carrying 57 tons, which has been attached to the boat train already described, and with this large additional weight the decrease in speed was only such as to make a difference of three quarters of an hour a day, a retardation almost imperceptible. Another new iron boat has also been constructed; she is a twin boat, or double one, having one paddle, working in the centre, which prevents the usual swell created by the ordinary paddle-boat; this steamer has already been tried on the canal, and found to require less power to do the same work as the screw-boat and train above alluded to. The substitution of iron for wood, and the successful introduction of steam-power, forms an era in canal navigation, and opens up a wide field for enterprise. In our Journal of May 6, 1848, we inserted a description, accompanied by a diagram, of a novel plan of steam haulage, patented by our old correspondent, Mr. Andrew Smith, to which we may here with much propriety allude. It consists of a tug-boat, with a six-horse power engine, connected with simple and inexpensive machinery arranged for the purpose. Along the bottom of the canal a galvanised wire-rope is placed laterally, and is worked on by the machinery, somewhat after the old well-known principle of "warping" vessels. The "grip" on the rope is so arranged that it can at any moment be let go, and as instantly taken up again, without any difficulty or delay, and the system entirely avoids the agitation of the water and destruction of the banks. The patentee states that such a boat will exert more force than a paddle-wheel engine of 18-horse power, and, in fact, draw a boat so fitted after her. It is estimated that, at a cost of 3*l.*, 200 tons may be carried 42 miles per day, or 8400 tons one mile at the rate of 3½ miles per hour, or one-twelfth of a penny per ton per mile. The immense saving over horse traction by this arrangement is obvious, and even over screw propellers; and we think it would be well worthy the attention of all parties interested, particularly those who are not bigotted to old and evidently imperfect systems, to give the invention a fair trial.

PROGRESS OF SCREW-PROPELLER STEAM NAVIGATION.—The vastly extended, and still increasing, demand for freights in ships which may be expected to perform their destined voyages with safety and rapidity, within the past 10 or 15 years, arising out of numerous circumstances connected with our commercial progress, opens out a large field of enterprise for the employment of capital, in the construction of fast vessels on the most approved practical modern plans, which holds out good hopes of return. We have now before us the prospectus of a company, formed by a few gentlemen of high commercial standing in the City, and principally connected with our mercantile marine, under the designation of the London Auxiliary Screw-Ship Company (Limited). The promoters, considering the vast importance of our rapidly-increasing trade, both foreign and colonial, and the consequent absolute necessity that the transit of goods and merchandise should be conducted with the greatest possible rapidity, regularity, safety, and economy, are now proceeding to carry out their views by a subscribed capital of 200,000*l.*, in 10,000 shares, of 20*l.* each. Availing themselves of all the discoveries in modern steam navigation, the directors propose to construct a fleet of iron clipper-built ships, fitted with an auxiliary screw-propeller, by which means they will not be delayed on their voyages by calms or contrary winds; their rapidity and regularity will materially curtail the expenses, and the profitable returns from the greater number of voyages performed, about three to two over ordinary vessels, and the increased amount of tonnage will be proportionably augmented. It is not contemplated to confine these vessels to any particular lines or stations, but to employ them from time to time where they will be most likely to find profitable employment; and the great success which has hitherto attended all steam navigation companies conducted on sound principles, and with sufficient capital, shows that a safe commercial business may be secured, with largely profitable results. With the view to commence operations at the earliest possible moment after the complete formation of the company, allotment of the shares, &c., conditional arrangements have already been entered into for the construction of two superior vessels, so that none of those delays may take place which experience proves has often been so injurious in the early stages of the proceedings of public companies. To prevent inconvenience from uncertain calls, it has been decided that the sum of 4*l.* per share be paid on allotment, and the remainder by instalments of 2*l.* each, at intervals of not less than two months between each. As the company is formed under the provisions of the recent Act of Parliament, the responsibility of each shareholder is confined to the extent of the shares held by him.

THE POSITION OF ENGLISH EXHIBITORS IN THE PRIZE LIST OF THE FRENCH EXHIBITION.—The Exposition has now finally closed, and men have time to reflect upon the results likely to accrue therefrom to themselves, their class, and their nation. The enthusiasm has cooled down, the false glitter has passed away, and exhibitors now ask themselves "What good have we gained, or are likely to gain, from the public communication of our inventions?" Statesmen, interested in the progress of nations, begin to direct their ingenuity to ascertain how the various people they represent are to be benefitted by this monster show in Paris, while earnest seekers after truth enquire if they are to receive the results of the Exhibition—that is, the verdicts of the juries—as decisions from which there is no appeal: facts henceforth to be accepted without dispute—nay, without impugning. It will be in the remembrance of our readers that at the time of the Hyde Park Exhibition the question of prize medals was seriously argued; and that it was finally decided, from a conviction of the incapacity of any selected body of men to make decisions, where there was such close competition, which would be just, or even trustworthy, that it would not only be unfair, but productive of public injury, to exalt one manufacturer above his fellows, and to give his goods the stamp and prestige of official preference. Wisely, these councils were adopted, and by giving to every exhibitor a medal, all were treated alike; none were exalted, none abased, so that in this respect our show was as harmless as a distribution of prizes in a ladies' fashionable boarding-school. In England, Prince Albert's scheme, as it is now called, was our first attempt, and we were not fettered by precedent, but free to adopt whatsoever course seemed best. Unfortunately, in France it is different. From the time public exhibitions of the works of industry were first inflicted on the country, marks of distinction have been conferred upon some portion of the exhibitors, which have been used as a recognised and accepted means of puffing by manufacturers and shopkeepers. Hence the Imperial commissioners felt themselves forced to give medals, and have, consequently, sown broad cast the seeds of dissatisfaction and jealousy; indeed, how could it be otherwise, although the marks of distinction were distributed to 12,000 out of some 26,000 exhibitors. We have, therefore, not only 14,000 dissentients, but out of the 12,000 who gained prizes, all who did not gain the *grande medaille d'honneur* think they have been unfairly dealt with, so that out of the whole number there are not probably more than some 300 contented persons. It may be answered that it were a hopeless effort to attempt to please every one; but there is a vast difference between that and making every one displeased. The juries had, doubtless, a most difficult task to perform, not only to do justice, but also to conciliate the good will of all parties. The French members, while as desirous of acting impartially as it were possible for them to be, could not help being inwardly prompted to predistinguish their fellow-citizens; and were, perhaps, unconsciously biased in their behalf. The same failing existed with the foreign juries, and it is pretty notorious that in very many instances their awards were anything but unanimous, so much so that the Prince President, in his speech, felt bound to allude to it, although he qualified the international dissent which existed as not being "greater than that which existed formerly between the various provinces of France." To persons well read in the history of France, who remember how men of the Franche Comtè used to request in their wills to be buried with their face downwards in their hatred of French dominion; how Bretons indignantly refused the title of Français; how Normand, Gascon Provençal, and Picard were ever ready to fight between themselves and against the kings of France; the simile of the Prince Napoleon will appear even an exaggerated statement of the dissent which existed among the juries; in fact, it was tantamount to saying that they were utterly discordant—a most ungracious admission, when it is recalled to mind how great in all cases was the preponderance of the French element. We might enlarge upon this point, but we prefer to let the facts speak for themselves. They will prove more eloquent and more convincing than any written argument, however logically put. The first class relates to mining, engineering, and metallurgy; it includes 48 exhibitors, among whom are Sir H. T. De la Beche, Sir Robert Kane, the Bowling Iron Company, J. H. Blackwell, Bankart and Son, T. Sopwith, some of the great English copper companies, &c. A *medaille d'honneur* only was accorded to the Board of Trade collection of iron; a very questionable and unsatisfactory distinction, since it was not only of the second class, but had to be divided among some 50 odd persons. True, Dr. Logan got the Legion of Honor under this class, although he was not an exhibitor therein, and it cannot, therefore, be said that this distinction was accorded to a representative of English mining or metallurgical science. In the same class there were four Frenchmen, three Belgians, and one Austrian, who received the Legion of Honour or the *grandes medailles d'honneur*. No Englishman obtained one, with the exception of Dr. Logan. They were divided among three Belgians and one Prussian. The *medailles d'honneur* were distributed in the following proportions:—Three to France, one to Hanover, one to Prussia, one to Austria, one to Belgian, and one to England, for the geological survey of the United Kingdom, in addition to the exceptional *medaille d'honneur* before alluded to. In the fourth class, general mechanics applied to industry, Fairbairn was created a Knight of the Legion of Honour. No Englishman obtained a *grande medaille d'honneur*, and only one English firm, that of Messrs. Todd and Macgregor, obtained a *medaille d'honneur*, although this class included the great gas-meter makers of London, without a rival on the Continent—Barrett, Exall and Andrews, Clayton, Shuttleworth, and Co., Dray and Co., Hornsby and Co., Ransomes and Sims, J. Rennie and Son, Seaward and Capel, Bramah and Co., Easton and Amos, Merryweather, &c. In the same class, one Swede and one Frenchman got each a *grande medaille d'honneur*, and five Frenchmen and one Badenman a *medaille d'honneur*. With these facts before our readers, we ask them to reflect, and ask themselves if full justice has been done to our mining engineers, who are sought for all over the world; or to our metallurgists, who have done more for the advancement of this particular science than, perhaps, all the metallurgists of other nations put together; or to our engineers, whose superiority is incontestibly recognised throughout Europe, by the eagerness with which their services are engaged?

CONNECTION BETWEEN ATMOSPHERIC PHENOMENA, AND EXPLOSIONS IN COAL MINES.

[Transactions British Association.]

A paper by THOMAS DODGSON, B.A., Cambridge, "On the Relation between Revolving Storms and Explosions in Coal Mines," related to a subject of very general interest. There are two distinct conditions necessary to produce an explosion in a coal mine, the inflammable nature of the air, and its ignition. The manner in which these two conditions generally arise are too well known in practice to require any comment, and the paper merely proposed to consider explosions in coal mines solely with reference to meteorological influences. These take effect when an increased escape of carburetted hydrogen gas occurs from the coal, consequent on the diminished atmospheric pressure, indicated by a fall of the mercury in the barometer; or by a deficiency of air when the ventilation of the mine is impeded by the increased temperature of the external air, indicated by a rise of the mercury in the thermometer.

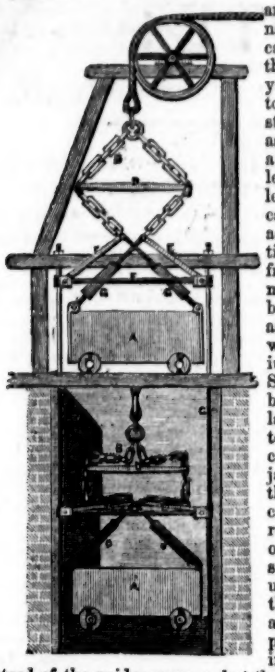
Mr. DODGSON attaches but little weight to the tables which have been compiled in reference to the subject. They are generally defective, but even if they had been perfect the results would still have been illusory, so long as attention was confined to the action of the barometer and thermometer at the time of explosion, for the transit of a great atmospheric storm generally occupies several days, during which a mine may continue in a dangerous state, ready at any moment to explode, and the accident may be even delayed until the storm has entirely passed over, and the mercury has assumed the height usual in settled weather. The opinion that explosions in coal mines are to some extent dependent upon changes in the condition of the atmosphere, has been long entertained by the colliers of the mining districts of Great Britain and France, and has been repeatedly expressed in the minutes of evidence taken before Parliamentary committees. It appears, also, to have been satisfactorily established by observation that the inflammable carburetted hydrogen gas oozes out from the coal in greatest abundance when the barometer has fallen considerably, and when a south wind blows from the south-east, south, or south-west points of the compass; and that, on the contrary, the mine is most free from gas, and explosions are less frequent, when the barometer is high and the wind northerly. The general law of storms tends to show that the several meteorological conditions which have been observed to precede or accompany a highly inflammable state of the atmosphere in a coal mine, are only so many direct consequences of that law in a northern hemisphere. The storms which sweep over Britain and continental Europe during the autumnal and winter months rise first in the West Indian Islands, and, after coasting the seaboard of the United States, cross the Atlantic in a north-easterly direction. These storms are simply immense ærial eddies or whirlwinds, which expand gradually as they proceed, their mean diameter frequently extending 1000 miles by the time they impinge upon our coasts. The atmospheric pressure diminishes continuously, but at an accelerated rate from the circumference towards the centre of a revolving storm. The mercury at any assigned place while the storm is passing will at first fall, and afterwards rise, at first rapidly, but afterwards much more slowly, as the second part of the storm is passing over. When a revolving storm approaches Britain, the mercury begins to fall, and the wind to blow from the southward, and it is under such circumstances that experience has proved coal mines are most liable to explosion.

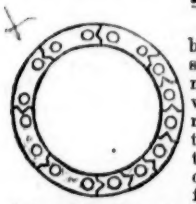
The shifting of the wind is reckoned by miners amongst the symptoms of danger. As the different coal fields of Great Britain are sometimes subjected to the same action, the occurrence of nearly simultaneous explosions in mines far apart may be anticipated; and, since storms travel east-north-east, explosions in continental mines will occur in French and Belgian coal mines a day or two after a storm has passed over the British Islands. If the number of such cases should be found to be considerable, it will furnish strong evidence of the connection between revolving storms and explosions in coal mines; but, unfortunately, our mining records are defective with regard to the phenomena which are eligible as proofs in this enquiry. Mr. TAYLOR'S tables were then referred to as establishing, from an experience of 44 years in the north of England, that the number of explosions in a great measure accorded with extensive barometrical changes; but there is an increased liability to explosion in hot weather, as the efficiency of the ventilation of a mine depends on the difference between the temperature of the air in the mine and that of the air above ground. An explosion is imminent, whether the decrease of atmospheric pressure during a passing storm causes the gas to be in excess in the mine, or the increase of temperature of the external air checks the ventilation, and causes a deficiency of air in the mine. Mr. DODGSON referred to a list of 90 explosions which had taken place since 1820 (and the number might be augmented), in all of which warning was given, by the thermometer or barometer, that the atmosphere of the mine was becoming explosive, and that, therefore, danger impended. It follows, accordingly, that the indications of these instruments are as important to the miner as they have been long recognised to be to the mariner. As the lives of all the human beings in a mine may depend on an individual, it is important that every person employed should have the greatest facilities of seeing the instrumental notice as the herald of danger. A barometer of water or of linseed oil, with a range of several feet, in a conspicuous position near the mouth of the coal pit, would prove much more effectual as a warning to the many than the ordinary mercurial barometer.

NEW IRON SHOT-TOWER—SHOT MANUFACTURE.—A tower of novel construction, formed of cast-iron, intended for the manufacture of shot, has just been erected in New York, by Mr. J. McCullough, a celebrated shot manufacturer, of 30 years' standing, the designer and builder being Mr. James Bogardus, the first projector of iron houses. The foundation of the tower is of solid masonry, 4½ feet thick, on a firm basis, 18 ft. below the surface of the ground, and 25 ft. diameter; on this is bolted the first portion of the iron structure, through 20 holes, 18 in. apart, by wrought-iron bars, 2 in. diameter, to which the lower tier of cast-iron pillars are securely keyed. This tier of cast-iron columns supports the entire superstructure, and they are of sufficient strength to sustain a weight of 28,000 tons. Upon the tops of the first tier of these columns there rests a cornice, made in 10 sections, each pair meeting over the centre of a column. Upon the lines of junction stand the next tier of columns, then another cornice, succeeded by more columns, all made to break joint, and are firmly bolted together. These are carried up to the height of 174 ft. above the ground, a sufficient altitude for casting the largest shot. The first two stories are left open between the pillars; above that they are filled in with panels of brick work, to protect the men from the weather. The tower tapers from 25 feet outside diameter to 15½ feet, the inner compartment being 2 feet less. The metal employed in the construction is something under 100 tons, less than 170th part of what the first tier of columns would sustain. The entire construction is said to be as firm and strong as if constructed of solid iron. In the top storey of the tower a quantity of lead is kept in a molten state, in a large iron pot, heated by a furnace. This is taken up in an iron ladle and poured into a colander, the holes in which regulate the size of the shot. The stream of spherical drops falls into a large tank of water placed in the lowest floor, and there the shot cools down to the boiling point of water, having retained sufficient heat in their descent to keep the liquid in a constant state of ebullition. The process requires practical experience, care, and skill. The shot is then lifted from the tank in an iron ladle, and placed on an inclined board to drip, from whence it slides into an open iron box, heated by steam, where it is dried. It is then placed in an angular barrel on a rotating axis, with some fine plumbago, which gives them a fine black colour, and a high polish. After this process they are placed on very smooth inclined ways, having sides, but open at the upper and lower ends; the perfect shot run rapidly in straight lines to the bottom into a bin, while the misshapen roll with a zig-zag motion to the sides, or do not move at all. Sieves of different sized meshes are employed to separate the sizes, when they are placed in canvas bags ready for market. Mr. McCullough estimates that this tower is capable of making 5000 tons of shot per annum. Several hands are also employed in moulding bullets of all sizes required for sporting purposes.

SMITH'S MINERS' SAFETY CAGE.

That veteran wire-rope maker, Mr. Andrew Smith, has recently devised and patented a happy and ingenious application of his staple commodity, in reference to the safety apparatus of the miners' lifting-cage. Our sketch represents this novelty in its effects under the two conditions of a solid and broken winding-rope. The ordinary winding-rope is attached to the cage, A, by two chains, B, shackled to the two cross connecting elastic lanyards, C, the ends of which are fastened to the opposite sides of the cage. A stretcher, D, is shackled to the chains so as to keep the latter distended, to form a right angle with the eccentric jam levers, E; the external ends of these levers are jointed to a cross, F, of the cage. The two ends of this cross-bar act as guide-eyes for embracing the vertical lengths of wire-rope, G, extending from top to bottom on each side of the main shaft; the ends of the levers, E, being hinged to the bar in such manner as to leave the guide-ropes, G, clear, when the parts are in the position shown in the upper portion of our sketch. Should, however, the winding-rope break, the elastic contraction of the lanyards, C, draws down the levers, E, to a horizontal position, causing the eccentric jointed ends of these levers to jam the guide-ropes, G, in the ends of the cross-bar, F, and thus sustain the cage. The frightful occurrence of a rope's failure is shown in the lower part of the shaft; the cage being entirely supported by the nip of the levers, E, upon the guide-ropes. The action of this contrivance must be very certain, and the detaining hold of the safety nippers must be equally secure. Rods of iron, or wooden bars, may be used instead of the guide-ropes, G, but the wire-rope is to be recommended for more reasons than one. If our colliery owners could be induced to adopt a safety contrivance of this kind, with the additional apparatus for preventing overwinding, we should hear little about cage accidents. The miner has, indeed, plenty of unrelenting underground enemies, without leaving him at the mercy of treacherous ropes.





PATENT DOVETAILED ARCH BLOCKS.—These blocks, designed by Mr. W. Austin, of Holywell-street, Westminster, for the construction of tunnels, arches, drains, &c., as shown by the diagram, when once united in a complete ring are inseparable and indestructible. The blocks can be made to unite so closely and uniformly in their joints, that little or no cement or mortar is really required. The blocks being prepared to any size, from 1 to 100 cubic feet, in iron moulds, ensures their uniformity and regularity, internally and externally, and no labour beyond that of fixing or setting is required. Considerable facility is afforded for this by the orifices through the blocks, which form grip holes for sling chains in lowering into the works, or for hoisting, if used vertically; but the principal intention of the orifices is to strengthen the works by forming dowels, or vertical ties, for grout or bolts to pass through, each block breaking bond, as shown by the dotted lines on sketch, and form the strongest fabric which can be constructed for the various purposes enumerated. The principle is also applicable for straight walls of masonry, and can be used in horizontal positions, such as railway tunnels, sewers, and aqueducts; but its most valuable appliance will be in the really economic aqueduct tube for bringing water into our large towns, cities, and villages, instead of the iron piping now used, the iron pipes costing three times as much as the blocks, of short duration, quick of decay from rust or oxidation, and damaging the purity of the water by the impregnation. The material of these blocks is imperishable, being unabsorbent of salt or fresh water, consequently the water supply from the spring or head reservoir would flow pure and uninterrupted for centuries, and leave something for posterity to talk of, what their forefathers had achieved. It is certain the present rotten and expensive systems, from their short endurance, of brick railway tunnel building and sewers must be abandoned for that which is really permanent, effective, and economic, in the real sense of the word. We have lately had several falling railway tunnels, and there are plenty more will follow in a few years; and this assertion is openly made by those who know too well how half-burnt bricks, bad mortar, and worse cement (so-called), have frequently been slopped in over the centres to railway tunnel arches, which latter daily show the progress of decay, and washing out of joints, the forerunners of ultimate collapse and downfall. In the fabrication of these masonry blocks, Mr. Austin proposes to employ Hutchison's patent process for indurating building materials, so often noticed by us, and which converts chalk, sand, and the most friable substances, into hard and indestructible material. The dotted lines show the bonding of alternate joints, the openings changing over each in succession, through which bolts, dowels, or grout, are placed as ties, firmly binding all together. The blocks are dovetailed in their ends, forming additional strength, not shown in section.

WHITE COPPER.—A correspondent has fowarded to us the following particulars respecting the manufacture of Chinese white copper:—Tradition says that the Yûn-Nân district formerly produced white copper, the ingots of which that are preserved being of a fine grain, and harder than that at present obtained. The copper when raised is red, and from the description given by the various workmen, the writer learned that the ore, when taken from the mine, was placed on a layer of wood, covered also with wood, and kindled. At the Lôn-Kôn-Tchâng Mine this operation was repeated seven times, in others five, and in some only three times, experience being the only guide as to the number of times necessary for each description of ore. The ore thus heated was reduced to powder, or small grains, and 700 lbs. taken therefrom were placed in a large furnace on a bed formed of a mixture of coal and oak charcoal, covered with some of the same mixture, and kindled; this operation was not repeated, but if the ore were of good quality, the result would be from 220 to 300 lbs. of copper, in a roughly-formed ingot. Four small furnaces were then brought into requisition in place of the larger one above-mentioned; a fact that claimed particular attention, and a point upon which the workmen were unanimous was, that neither coal nor oak charcoal ought to be employed in this part of the operations, but that it was absolutely necessary to use fir charcoal. From this rough ingot 80 lbs. were taken, and 20 lbs. placed in each of the furnaces, when, if the ingot were good, it gave about 12½ lbs. for each furnace. Two of these pieces were taken and again submitted to the fire, with 5 lbs. of the best red copper, a great heat was obtained, and about 9 lbs. of copper was usually the result. These preparatory operations being completed, 3 lbs. of the double refined, and 3 lbs. of the triple refined, mixed with 2½ lbs. of the best red copper, were fused, and when the molten metal began to show a white head, 1 oz. of tin (kienne) was thrown in, and the copper almost instantaneously became white; the product, if the operation was well conducted, being about 4½ lbs.

JOURNAL BOXES.—Mr. Joseph Garratt, of Indianapolis (U. S.), has patented the production of an alloy, of a bluish grey colour, which, while it has unsurpassable anti-friction qualities, has also sufficient tenacity to allow of journal boxes being formed of it that do not require the protection of outer casings of a harder metal, the said alloy being composed of zinc, copper, and antimony, in about the following proportions;—17 parts zinc, 1 part copper, and 1½ part of antimony, or any other mixture substantially the same, and which will produce the same effect.—Dr. B. F. Lawton, of Troy, has invented an alloy, consisting of wrought-iron, copper, tin, and arsenic, combined in various proportions, according to the degree of hardness, toughness, or other quality it is desired to make it a superior alloy or box metal. Dr. Lawton has also patented an improved box metal, consisting of cast-steel, nickel, copper, and tin, prepared and admixed in various proportions, according to the requisite degree of toughness or other quality that may be desired to make it a superior box metal or alloy.—Mr. Edward Campbell, of Columbus, thus specifies his claim for glass journal boxes:—"I do not claim the union of glass and iron, whilst the former is in a plastic state and the latter at a red heat, by pressure to produce a welding of the two; but what I do claim is, a journal box composed of an iron body and an anti-friction lining surface of glass, when the said glass lining is combined with its iron back."

THE PARIS UNIVERSAL EXHIBITION.

We subjoin a list of the English, British Colonial, and American exhibitors, who have received medals and honourable mention at the late Paris Universal Exhibition:—

MINING AND METALLURGY.

FIRST-CLASS MEDALS: Bagnall and Sons, England; Bankart and Son, Neath, Glamorganshire; Bowling Iron Company, Bowling; L. Busson du Maurier, London; Board of Trade; W. B. Clark, Sydney; Coalbrook Dale Iron Co.; Council of the Duchy of Cornwall; Cwm Avon Iron Company; Cwm Celyn and Blaina Ironworks: Derwent Iron Company; Dowlais Iron Company; Dundyvan Iron Company; Gospel Oak Ironworks; Griffith, Dublin; Mersey Iron and Steel Company, Staffordshire; Rhymney Iron Company; Shelton Iron Company; T. Sopwith, Allenheads, Northumberland; and Weardale Iron Company.—SECOND-CLASS MEDALS: Barrows and Hall; Blaenavon Iron Co.; L. Busson du Maurier, London; Calvert, Birmingham; Commissaries of New South Wales; East India Company; Ebbw Vale Iron Company; Gartsherrie Iron Company; Devonshire Great Consolidated Copper Mining Company; Knight and Co., Kooley Ironworks; H. Mackworth, Clifton, Gloucestershire; Millington and Co., England; Monkland Iron Company; Mylne, London; Odernheimer, New South Wales; Philosophical Institution of Bristol; Pontypool Ironworks; G. H. Ramsey, Newcastle-on-Tyne; Tredegar Iron Company; J. Wales, Hetton Colliery, Durham; Whitehouse Ironworks; Ystalyfera Iron Company.—HONOURABLE MENTION: Abercarn Works; Anthracite Steam Fuel Company, Llanelly, Carmarthenshire; Bird, London; British Iron Company; Calder Iron Co.; H. Carr, Peterborough, Warwickshire; E. Chitty, Jamaica; Clay and Newman, Droitwich; F. W. Knight, Kidderminster; L. Locharme, San Francisco; Lebbe-Pacquier-Tanby, Colombo, Ceylon; Lilleshalt Iron Co.; W. Murray, Glasgow, Lanark; Noak, Droitwich; Norrie, Sydney; Osier Bed Iron Company; Pioche-Bayerque and Co., San Francisco; J. J. Reid, Chester; Rogers, Abercarne, South Wales; Samuelson and Co., Middlesbro'; De Soysa, Ceylon; Tipton, Carr, and Co.; Valenton and Wheelock Boston; Valpy, India; A. Wheeler, San Francisco.

RAILWAY MACHINERY.

FIRST-CLASS MEDALS: S. Blackwell, London; J. Eastwood, Derby; W. Fairbairn, jun., Manchester; Peters and Son, London; T. R. Starey, Nottingham; C. Heard Wild, London.—SECOND-CLASS MEDALS: J. A. Crow, at M. Stephenson and Co., Newcastle; Permanent Way Company, England; J. Dunlop, Haddington, Lothian; P. R. Jackson, Manchester; E. Kesterton, London; L. Kircup, at M. Stephenson and Co., Newcastle; W. Lennon, Dublin; Parsons, England; Rock and Son, Hastings; J. D. Shipley, London; E. Snowball, at M. Stephenson and Co., Newcastle; C. Thrupp and Co., London.—HONOURABLE MENTION: I. Adelbert, London; W. and G. Ashford, Birmingham; G. Barrington, Montreal, Canada; Bengough Brothers, London; R. Blyth, London; Davies and Son, London; Dunn, Hattersley, and Co., Manchester; B. Ellam, London; Greaves and Co., Patent Railway Sleeper Company; H. and A. Holmes, Derby; Hooper and Co., London; J. F. Howard; London; S. Hudson, Dublin; W. Langdon, London; W. Midlemore, Birmingham; E. J. Rowland, Manchester; Stevens, London; Swaine and Adney, London; W. F. Thorn, London; Thornton, Birmingham; J. Ward, London.

HEAT, LIGHT, AND ELECTRICITY.

FIRST-CLASS MEDALS: D. Bailey and Co., and Dr. E. Arnott, London; Chance Brothers, England; Edwards and Son, London; W. T. Henley, London; Kuper and Co., London; R. S. Newall and Co., England; Ordnance Map Office, Southampton.—SECOND-CLASS MEDALS: Aland, England; J. H. Benham and Son, London; Brookdale Coal Company; Chinic, Simard, Methot, and Co., Quebec; G. E. Dering, Hertford; J. Dudley and Son, Northampton; H. L. Hoole, Sheffield; W. Jeakes, London; W. Pierce, London; T. L. S. Prideaux, London; Varley, England.—HONOURABLE MENTION: Cundy, England; Evans, Son and Co., London; Feetham and Co., London; Pollingswortz, New York; J. T. King, New York; Lindwors, United States; Messenger, England; Sheringham, England; Tyer and Co., England; Thos. Walker, Sheffield.

RAW AND WROUGHT STEEL.

FIRST-CLASS MEDALS: J. Bedford, Sheffield; Cocker Brothers, Sheffield; Firth and Son, Sheffield; Hawcreft and Son, Sheffield; Ibbotson Brothers and Co., Sheffield; J. Kenyon and Co., Sheffield; Kirby, Beard, and Co., London; Milward and Son, Redditch; J. Mitchell, Birmingham; J. Mosely and Son, London; J. Moss, and Gamble Brothers, Sheffield; J. Nowill, Sheffield; J. Perry and Co., London; J. Sorby and Son, Sheffield; Spencer and Son, Sheffield; Taylors, Vickers, and Co., Sheffield; T. Wilkinson and Son, Sheffield; J. Wilson and Son, Sheffield.—SECOND-CLASS MEDALS: R. Bagshaw, Sheffield; J. Bedford; Sheffield; W. Boulton and Son, Redditch; Butterley, Hobson, and Co., Sheffield; Cocker and Son, Hethersage, Derby; T. Garfitt and Co., Sheffield; J. J. Greaves, Sheffield; H. Higgins, Montreal; J. V. Hill, London; Hoole, Staniforth and Co., Sheffield; J. Howarth, Sheffield; Hinks and Wells, Birmingham; J. James, Redditch; T. Jowitt, Sheffield; M'Daniel and Co., London; J. Mason, Birmingham; G. Morton, London; Myers and Son, Birmingham; Parkin, Montreal; Saynor and Cooke, Sheffield; R. Scott, Montreal; H. Taylor, Sheffield; W. Thornhill, London; J. R. Turner and Co., Redditch; T. Ward, Sheffield J. Webster and Son, Birmingham; Windlebless and Windley, Walsall.—HONOURABLE MENTION: G. Beardshaw, Sheffield; H. Dale and H. Galt, Canada; J. Dawson, Montreal; D. Flather and Son, Sheffield; S. Fox and Co., Sheffield; A. Green, Sheffield; W. Jackson and Co., Sheffield; P. Jones, Brantford; J. A. F. Linley, Sheffield; G. and J. Oxley, Sheffield; Taylor Brothers, Sheffield: R. Timmins and Son, Birmingham; W. Wallace, Montreal; J. S. Warner, Sheffield; B. and J. Wilcock, Sheffield.

LITERARY NOTICE.

Adcock's Engineers' Pocket-Book for 1856; *with Almanack and Diary, Tables of the times of High-Water, List of the House of Commons, and Miscellaneous Information.* London: Simpkin, Marshall, and Co., Stationers' Hall-court.

This useful periodical, which has been for so many successive years before the public, and earned for itself the approbation and appreciation of the engineering and scientific community, has made its appearance. As usual, it contains numerous, extensive, and, we believe, authentic tables and formulæ for referential use in superficial and solid mensuration, strength and weight of materials, mechanics, machinery, hydraulics, hydrodynamics, marine engines, chemistry, laws of motion, specific gravity, calculations on the power of wind and water, British and foreign weights and measures, the gases, heat, &c., and extensive tables for estimating various information in engineering work with facility, and avoiding the necessity for the employment of a perplexity of figures. The table of squares, cubes, square roots, and cube roots, has usually received each year additional calculations, which now reach the number of 3000; and the circumferences and areas of circles are calculated up to 50 ft. diameter. In addition to all the usual matter, many tabular details of scientific statistics are introduced; also a well written and interesting memoir of the late Brigadier-General Sir Samuel Bentham, who may be fairly classed among those great men who it has often been remarked shed a radiance on the close of the eighteenth century. Perhaps no individual ever accomplished more for the mechanical improvement in the Navy of his country than did Sir Samuel Bentham; his numerous inventions, matured both when in and out of office connected with the Admiralty, are original, and of the utmost utility, and the incidents of his life will be perused with interest and admiration.

THE DOLCOATH MAN-ENGINE.

I sing no battle song,
No deeds of blood rehearse,
No steel-clad warriors prance along
The tenor of my verse;
No hero meets your eye,
From Alma's gory mound,
But Art and Science, sisters twin,
In Cornwall's mineral ground.

Help of the miner brave,
Man-Engine, hail to thee!
Lifting him up from Plutus' cave
Light as the air, and free!
Lifting him up! up! up!
Light as the zephyr's wing,
So that dull lassitude's lean form
Is now evanishing.

Hurrah for those below,
Who're digging in the ground;
Hurrah for thinking minds above,
Who such a help have found!

Hurrah, Man-Engine! come,
Ye miners, sing with me,
Lift up your voices like a trump—
"Eternal strength to thee."

Railways have cities on
To distant cities whirl'd,
And the electric telegraph
Sends whispers round the world!
But what are these to thee,
Old death's eternal ban,
Great helper of the bold and brave,
Thou lengthener of life's span!

From coffins, bones, and worms,
Could our forefathers rise,
On the improvements of this age
They'd stare with mute surprise.
Dolcoath, old mother-mine,
Still prominent appears,
The glory of the fabled West,
The queen of her compeers.

A DOLCOATH MINER,
Author of *Lays from the Mine, the Mountain, and the Moor.*

NICKEL AND COBALT IN AMERICA.—The cobalt and nickel mines worked by the Chatham Cobalt Mining Company are situate about six miles from Middletown, Connecticut, and the mining operations have now been in progress about 18 months. From the second annual report of Professor J. C. Booth, of the United States Mint, Philadelphia, we find that the shafts and levels are all within a short range of each other. They comprise the adit level on Roberts's lode, and another running parallel to it; the engine-shaft, and a cross-cut at 20 fathoms deep to connect the lodes, enables a correct judgment to be formed of their nature, extent, and value, in depth. The country is mica-slate, bearing on granite, the metal-bearing rock being much more quartzose and granitic, and can be easily distinguished from the former. The bearing and dip are uniform, richer in ore in the 20 fm. level than above, but of the same width and general character, and, probably, of unlimited depth. The ore is perfectly visible in grains throughout the lode, and the quantity may be estimated at 20 per cent. of the oxides of cobalt and nickel, or 10 per cent. of each metal, cobalt and nickel. Mr. Booth further states his opinion that these mines, when fairly developed, which must soon be the case, will exercise a powerful influence on the markets for the metals cobalt and nickel. Dr. E. Francfort also, in his annual report, congratulates the company on the present condition of their property, and states that when certain operations are carried out, which will be done easily in a short time, the property will rank high among the few legitimate mining enterprises of the country, and the most productive and reliable source from which these two metals will be afterwards obtained. Shode pits have been opened on Roberts's lode over a mile in length, and they find it everywhere composed of arsenical nickel and cobalt ore, garnet, spathose iron, quartz, black mica, felspar, gneiss, and flookan, along with which apatite, actinolite, iron pyrites, staurolite, sphene, and mispickel, are sometimes found, and, rarely, galena and zinc blende. Cobalt bloom, nickel green, and arseniate of iron, finer than any the Doctor ever saw from European localities, occur often with the former minerals. Coffin's lode is much richer in ore in depth than it was in the adit level, both as to quality and quantity. It is full of ore throughout, and may be considered the richest part of the mine. Driving on it east and west every day witnesses an improvement, and the fact of a well-defined lode of nickel and cobalt ore, from the surface to a depth of 120 feet, is thus clearly established. There are other workings, greatly adding to the wealth and productiveness of the mine; and tramroads and other appliances have been completed, and machinery for moving the tram wagons will be shortly put up. At surface the forces employed have been very large, engaged in erecting engine-house, mill building, making roads, erection of stamps, ore separators, &c. A furnace is recommended in the report for the sublimation of the arsenic contained in the ore, by which it can be concentrated and rendered worth from $500 to $700 per ton. The company now are in possession of more than 200 acres of mineral and other lands, and are in treaty for other portions. It is strongly recommended that a sufficient number of houses be erected for the accommodation of the workmen, and thus concentrate the operations, save much time, and quickly bring the property into a profitable and lasting condition.

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